COMPARISON OF THE FIT AND MATERIAL SUITABILITY OF CONVENTIONAL VERSUS THERMOELASTIC COMPUTER-AIDED-DESIGN AND -MANUFACTURING FEEDING PLATES IN INFANTS WITH CLEFT PALATE / CLEFT LIP AND PALATE

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Introduction

Cleft lip and palate are among the most common structural birth defects, affecting about one baby of every 500. Children with cleft lip and palate may have nutrition, speech and hearing disorders. Furthermore an altered position of the premaxilla may occure. For that reason feeding plates can be applied to direct growth of the separated parts of the maxilla with focus on the midline correction in unilateral clefts and premaxilla positioning in bilateral clefts. 3D-computer-aided-design and –manufacturing can simplify the production process of feeding plates [1]. In contrast to taking conventional impressions intraoral scanning does not carry the risk of impression material aspiration or infections caused by material remaining in the oronasal cavity.

Aim

The aim of the present study was to compare the fit and material suitability of conventional versus thermoelastic 3D-CAD/CAM feeding plates (Fig. 1) in patients with cleft palate / cleft lip and palate on the basis of different parameters such as need for adhesive cream, sore spots and plate breakage.

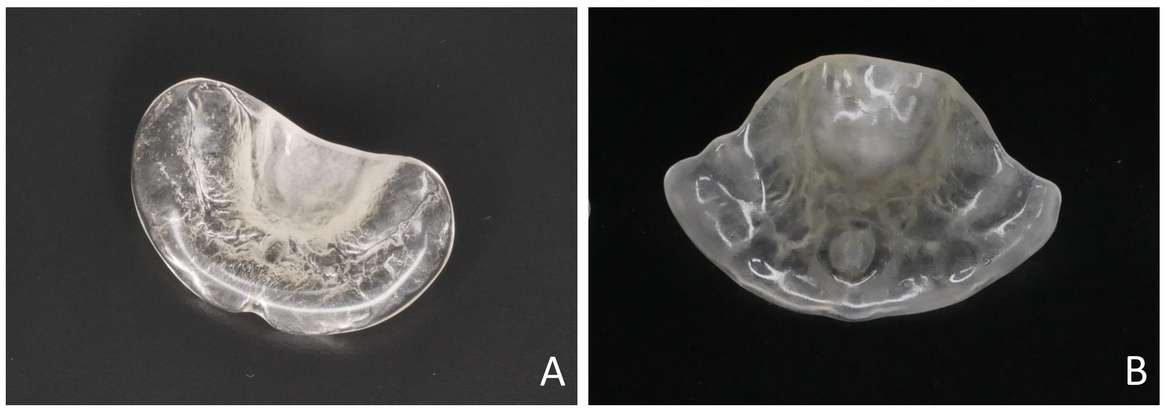

Figure 1: A) conventional manufactured feeding plate of a patient with cleft palate B) 3D-CAD/CAM plate of a patient with cleft palate

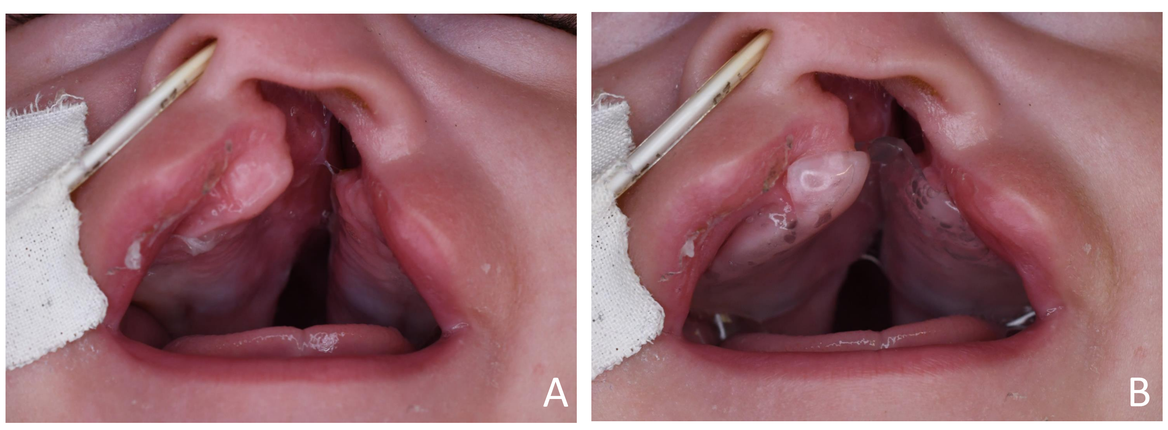

Figure 2: 6-months old patient with cleft lip and palate A) before B) after insertion of a 3D-CAD/CAM feeding plate

Material and Method

21 infants with cleft palate /cleft lip and palate were treated with either conventional (N=36) or 3D-CAD/CAM (N=26) (Fig. 2) feeding plates. 3D-CAD/CAM feeding plates were printed from an innovative thermoelastic material which is getting shapeable at body temperature. Different parameters (need of adhesive cream, sore spots and breakage) were compared in a retrospective study to assess the fit as well as the material suitability. A chi-square test was employed to compare the two different types of plates. The level of statistical significance was set at $p < 0.05$ (2-tailed).

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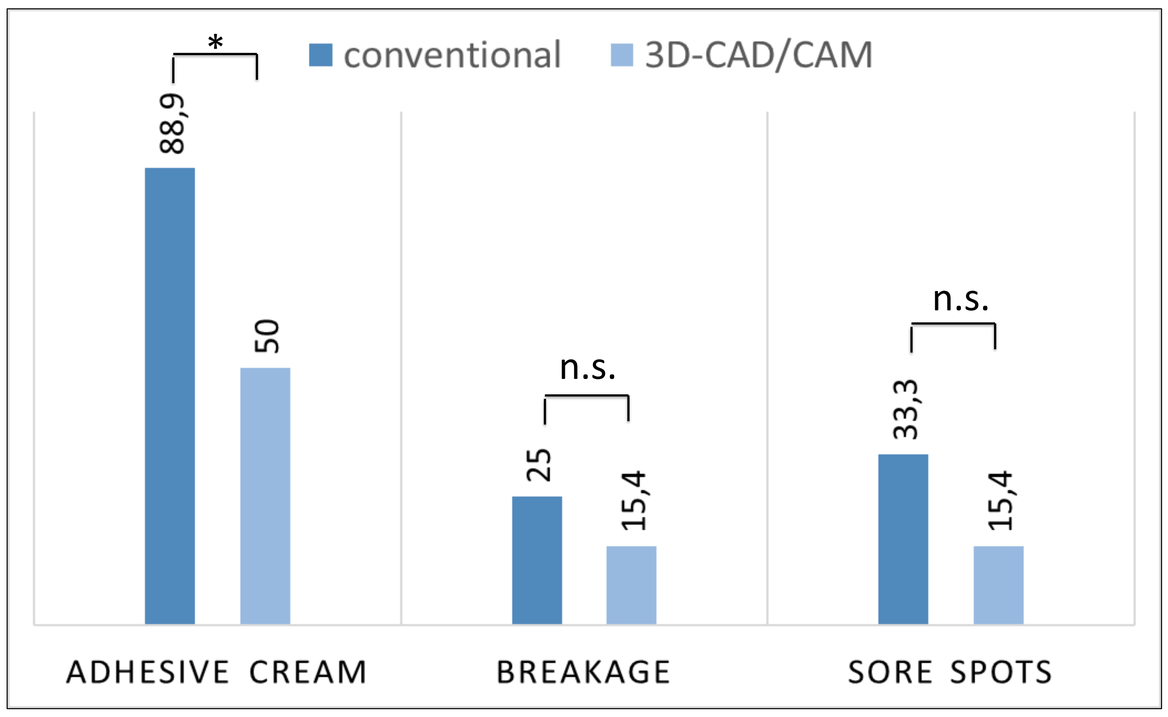

Figure 3: Incidence (%) of adhesive cream usage, breakage and sore spots in patients treated with conventional (N=36) vs. 3D-CAD/CAM (N=26) feeding plates. The need for adhesive cream was significantly higher in patients treated with conventional feeding plates (p<0.001). Breakage and sore spots were more common in patients treated with conventional feeding plates (n.s.= not significant).*

Results

The need for adhesive cream was significantly higher in patients treated with conventionally manufactured feeding plates (conventional: 88.9%, 3D-CAD/CAM: 50.0%; p<0.001) (Fig. 3). Even though plate breakage and sore spots were more frequent in conventional (plate breakage: 25.0%, sore spots: 33.3%) than in 3D-CAD/CAM (plate breakage: 15.4%, sore spots: 15.4%) feeding plates, no statistically significant difference was found (breakage: p=0.359; sore spots: p=0.111).

Conclusion

In infants with cleft palate / cleft lip and palate thermoelastic 3D-CAD/CAM manufactured feeding plates seem to have a more accurate fit than conventionally manufactured feeding plates as the need for fixative cream is less frequent. To evaluate the material suitability of thermoelastic 3D-CAD/CAM feeding plates further studies with larger sample sizes are needed. In addition comparative studies on the orthopedic effects of both types of plates should be performed (Fig. 4).

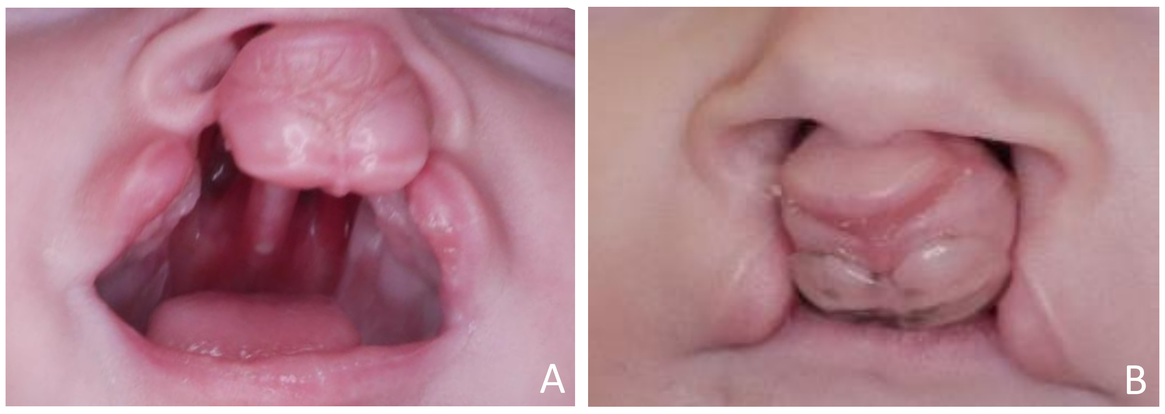

Figure 4: Patient with cleft lip and palate A) at the beginning of treatment B) after four months of treatment. The position of the premaxilla was improved throughout the first period of treatment.

References:

1 Xepapadeas, A. B., Weise, C., Frank, K., Spintzyk, S., Poets, C. F., Wiechers, C., Arand, J., & Koos, B. (2020). Technical note on introducing a digital workflow for newborns with craniofacial anomalies based on intraoral scans - part I: 3D printed and milled palatal stimulation plate for trisomy 21. BMC oral health, 20(1), 20